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WORKER EXPOSURE FROM HANDLING GRANULAR INSECTICIDES

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Introduction

Proper handling of pesticides and the use of personal protective equipment (PPE) has become an ever-increasing concern of farm producers and suppliers. Recent updates to the Worker Protection Standards placed requirements on handlers for the use of PPE. Despite these PPE requirements, however, growers do not always comply.

A study by *Successful Farming* showed that, of growers who apply their own pesticides, only 44 percent said they "always wear rubber gloves" when mixing and handling chemicals. Only 22 percent "always wear eye protection" and only 8 percent "always wear chemical-resistant coveralls or aprons."¹

In response to concerns about the long-term safety of growers involved in pesticide application, chemical companies and equipment manufacturers have developed closed chemical handling systems to protect growers during loading.

One of the first of these completely closed handling systems, the LOCK'n LOAD® closed handling system, was developed jointly by American Cyanamid Company and Deere & Company. Although several other systems are currently being developed, at this writing LOCK'n LOAD is the only granular insecticide system commercially available nationwide.

The LOCK'n LOAD system involves the use of planter insecticide hopper lids with valves designed to receive the valves of special insecticide containers. When a container is locked onto the hopper lid, the valves in both the hopper lid and container open, allowing the insecticide granules to flow by gravity into the hopper. These valves close automatically when the container is unlocked and removed from the hopper lid. The empty containers can be returned to the local chemical supplier for refilling and reuse.

To demonstrate the efficacy of this system in protecting growers from pesticide exposure, a study was conducted September 1, 1995, at Purdue University to compare the exposure to handlers using the closed handling system with that experienced by handlers using conventional insecticide bags.

Objective of Study

The objective of this study was to compare the effectiveness of closed handling systems, namely the LOCK'n LOAD® closed handling system, in reducing worker exposure to granular insecticides with that of conventional insecticide bags.

Procedures

The study compared three granular insecticide carrier alternatives in the following order:

1. Blank clay granules in the THIMET® LOCK'n LOAD® closed handling system.
2. Blank clay granules in the COUNTER® LOCK'n LOAD® closed handling system.
3. Traditional blank clay granules in 50-pound (unlabeled) paper bags.

The blank clay granules contained a fluorescent tracer material that was visible under black light conditions.

Three Purdue University undergraduate students participated in the study, one handling each of the three carrier alternatives outlined above. Each of the three students wore identical clothing, including dark blue long-sleeved shirts and blue jeans, to ensure that the tracer would show on the clothing consistently.

The following materials were used in the study:

- John Deere MaxEmerge 2, 7200 six-row planter
- Six LOCK'n LOAD® lids to fit John Deere MaxEmerge 2 planter
- One pallet (27 containers) of blank clay granules in THIMET® LOCK'n LOAD® containers
- One pallet (27 containers) of blank clay granules in COUNTER® LOCK'n LOAD® containers
- 50 bags of blank clay granules in unmarked 50-pound paper insecticide bags
- Three sets of appropriate PPE equipment
- Dark blue long-sleeved shirts and blue jeans for handlers
- Ultraviolet "black" lights
- "Blaze orange" fluorescent tracer material
- Four large industrial fans with variable speeds
- Wind speed measurement meter

A blaze orange fluorescent tracer material was mixed with "blank" clay granules at a rate of 1/2 cup to every 50 pounds of blank granules. A portable gasoline-powered concrete mixer was used to thoroughly impregnate the tracer on the clay granules. No actual "technical" insecticide material was used in the study. The tracer was selected for its ability to be easily seen under black-light conditions and to be removed with plain water from any surface.

The combined tracer and clay granule material was carefully poured into both LOCK'n LOAD® containers and conventional bags using a closed tubular loading system to prevent tracer contamination. The bags and containers were then carefully cleaned with water under controlled conditions to remove any contamination during loading, then checked by university personnel under a black light. If any contamination was detected, containers and bags were then recleaned to remove the tracer and rechecked under the black light until judged free of contamination.

The study and the "black light" photography were recorded on 35-mm film and 3/4-inch videotape inside the Purdue Ag Engineering building as well as in a dark room outfitted with ultraviolet "black" lights to record the amount of "exposure" to each handler.

Four industrial fans were placed behind the planter to simulate actual field conditions. Wind speeds for each segment of the study remained constant at 3.6 miles per hour.

Each handler loaded the six-row planter three times, completing 18 hopper fills, to more accurately reflect the amount of insecticide exposure during a typical day of loading in the field during planting.

The following steps were followed by each handler:

- Each of the three student handlers was kept away from the test area to avoid inadvertent contamination from the tracer material prior to the study.
- Prior to each of the three sequences—and exposure to the fluorescent tracer material—each handler was photographed under black lights.
- The first handler picked up the THIMET® LOCK'n LOAD® containers and loaded them onto the hoppers of the six-row planter.
- After the first loading was complete, the handler was again photographed and videotaped under black lights to ascertain if any exposure had occurred.
- The handler then conducted the second sequence of loading six hoppers, and returned to the black light room for photography and videotaping.

- The first handler conducted the third--and final--sequence of loading six hoppers, then returned to the black light room for final photography and videotaping.
- Following the first handler's third and final sequence, both the insides and outsides of the hoppers were removed from the planter and emptied in a container outside the building (to prevent contamination from the fluorescent dust) and cleaned with water to remove all traces of contamination from the tracer. The area around the planter was also swept clean.
- This same process was repeated by the second handler, who loaded COUNTER® LOCK'n LOAD® containers.
- This same process was repeated by the third handler, who loaded 50-pound bags of blank clay granules that had been treated with the tracer. Care was taken to ensure that the bags were opened and poured slowly.

Results

Using the bagged product, the handler received substantial exposure to the dust created during loading activities—as documented by the black light technique used—even though care was taken to open and pour the product slowly. The black light photos showed increased tracer exposure after each filling sequence of six planter hoppers. The tracer was especially visible on the handler's hands, chest, neck, and face, including the mouth, nose, and ears.

Using the closed handling system (LOCK'n LOAD system), neither of the two handlers received any exposure to the tracer, as detectable under black light conditions. The closed system essentially eliminated exposure to the tracer material.

Conclusions

There is no way of knowing if the "tracer" exposure documented in this study is a true representation of "insecticide" exposure, nor if the amount of tracer (insecticide) exposure visible with the traditional handling method is "significant" from a human health standpoint. If so, then use of a closed handling system for refilling planter insecticide hoppers can dramatically reduce, if not eliminate, exposure to the insecticide—assuming the use of a well-designed closed handling system and the fact that the handler uses care and follows the procedures established for its use.

Even so, growers must continue to use caution and common sense when handling any granular soil insecticide, regardless of the handling technique! For a closed system like LOCK'n LOAD, they should always use the personal protective equipment prescribed by the Worker Protection Standards, including long-sleeved shirt and pants, shoes and socks, neoprene gloves, and a neoprene apron.

For handling bagged material in the traditional manner, they should take great care to protect their hands, faces, and neck areas, even if the product carries a "Caution" label that requires minimum personal protective equipment. And, the hands, face, and neck should be thoroughly washed after handling activities, before touching other parts of the body which might quickly absorb chemicals.

¹Holmberg, Mike, *Successful Farming Magazine*, December 1992.

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